US006648808B2

(12) **United States Patent**
Totani

(10) **Patent No.: US 6,648,808 B2**
(45) **Date of Patent: Nov. 18, 2003**

(54) **PLASTIC BIG MAKING APPARATUS**

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(73) Assignee: **Totani Corporation**, Kyoto (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 93 days.

(21) Appl. No.: **09/879,111**

(22) Filed: **Jun. 13, 2001**

(65) **Prior Publication Data**

US 2001/0053737 A1 Dec. 20, 2001

(30) **Foreign Application Priority Data**

Jun. 15, 2000 (JP) 2000-179636
Aug. 28, 2000 (JP) 2000-257360

(51) **Int. Cl.**[7] **B26D 7/18**
(52) **U.S. Cl.** **493/342**; 493/82; 493/83; 493/281; 493/340; 493/373; 493/199
(58) **Field of Search** 225/99, 100, 103; 493/281, 82, 83, 342, 340, 373, 199

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(57) **ABSTRACT**

In an apparatus for making plastic bags from a web material comprising two or more layers of plastic film, the material is intermittently fed for a length along a longitudinal feeding path, to successively make plastic bags with wastes, each of the wastes having upstream and downstream edges. The apparatus includes partially cutting means disposed at a first station predetermined along the feeding path. The material is partially cut by the partially cutting means along the upstream and downstream edges of waste whenever intermittently fed and temporarily stopped. The apparatus further includes waste removing means disposed at a second station predetermined downstream of and at a distance from the first station. The waste reaches the second station when the material is intermittently fed again after partially cut by the partially cutting means. In addition, the apparatus includes discharge means disposed at a third station predetermined downstream of and at a distance from the second station. The material reaches the third station when intermittently fed again after partially cut by the partially cutting means. The material is pulled and torn by the discharge means from the downstream edge of waste to be discharged by the discharge means as a plastic bag, the waste being pulled, torn and removed by the waste removing means from the upstream edge of waste, after the waste reaches the second station and the material reaches the third station.

16 Claims, 6 Drawing Sheets

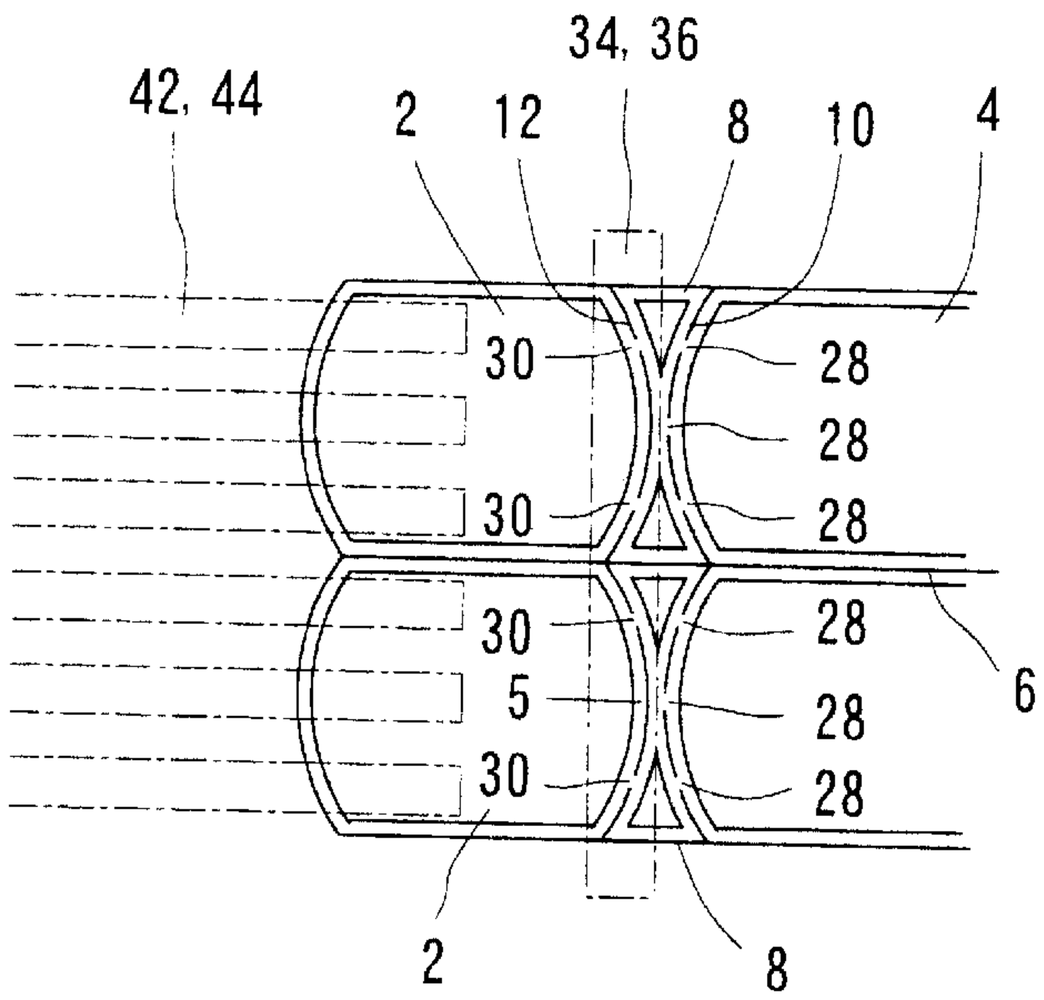
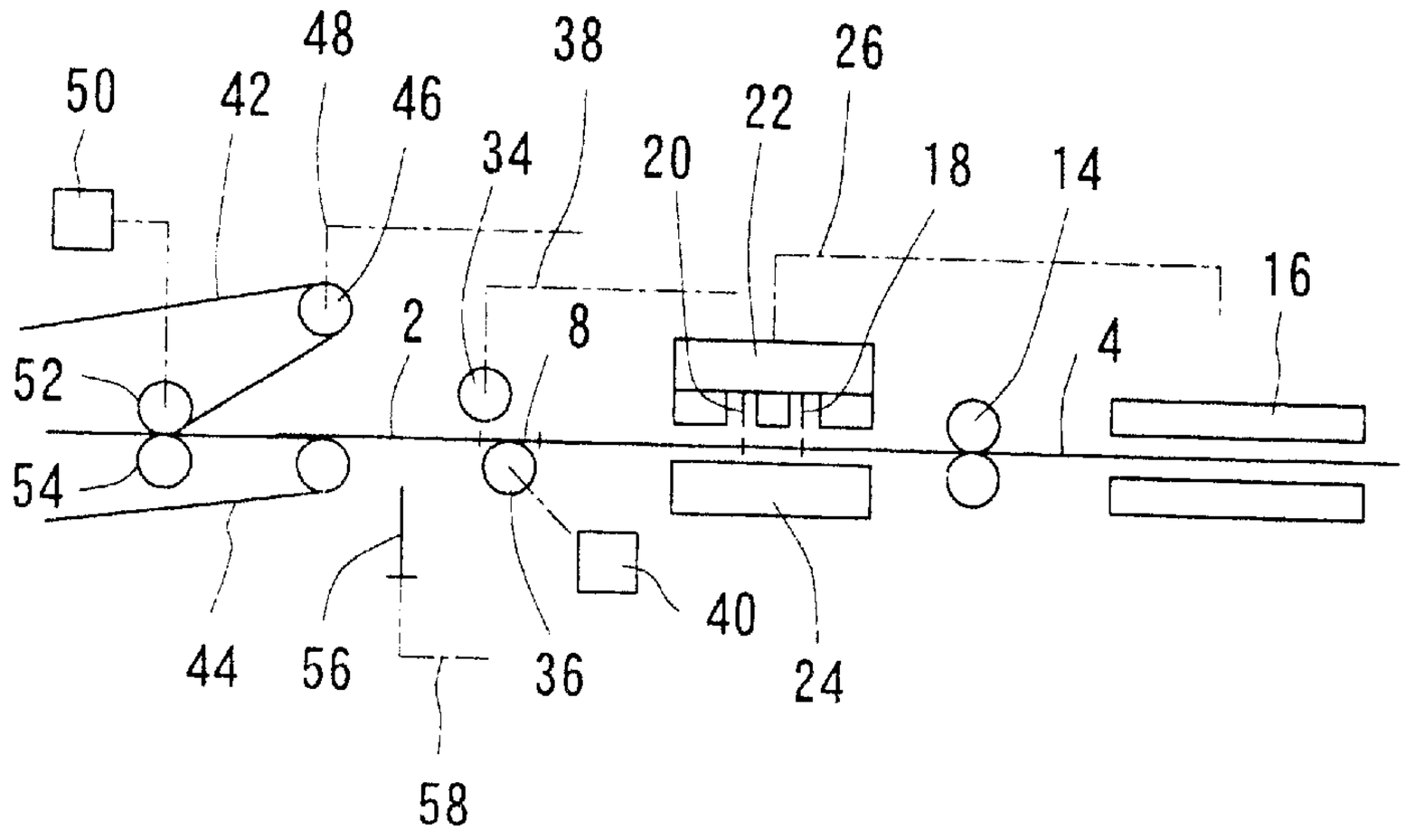


FIG. 1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38
26
50
42
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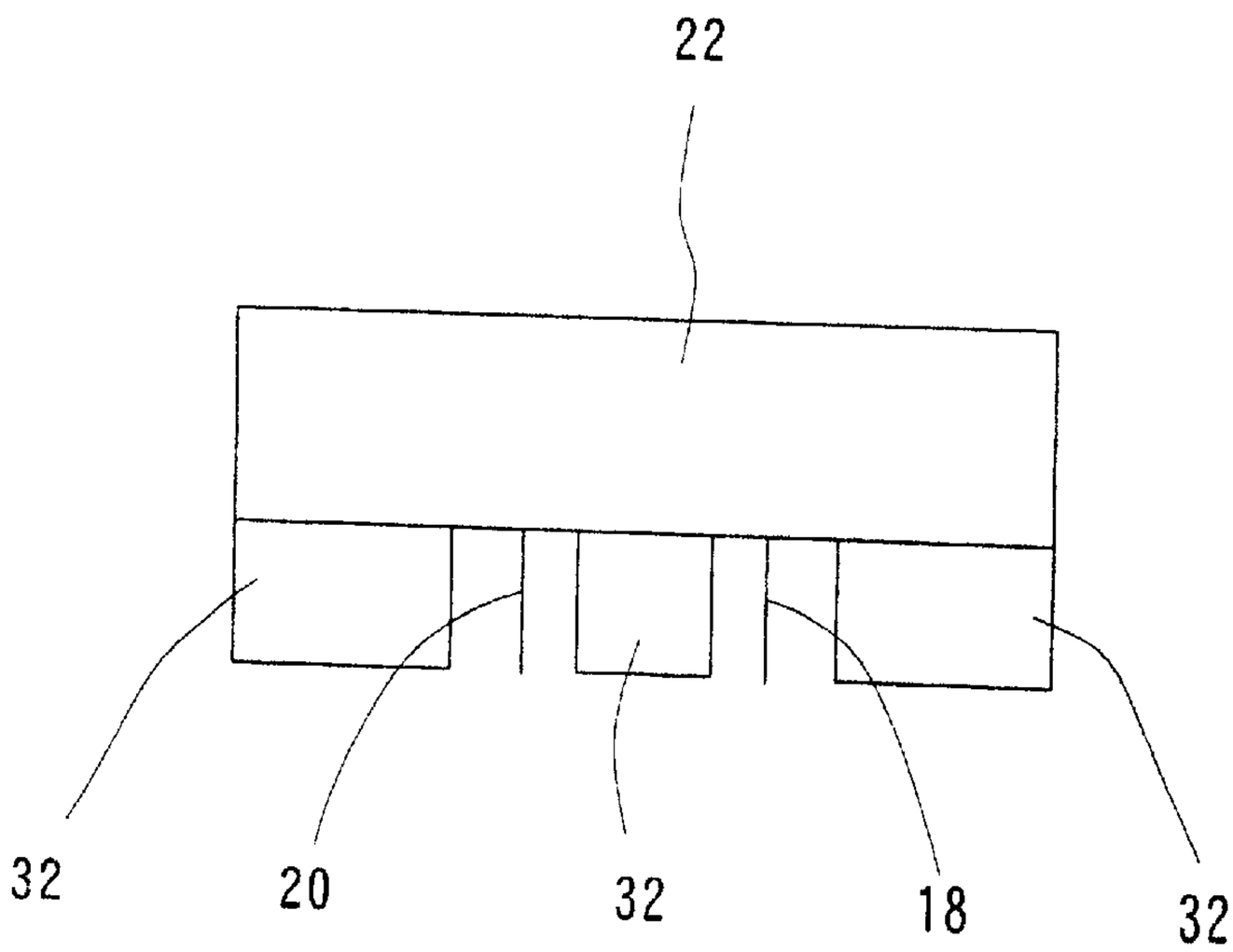
FIG. 2


22
32
20
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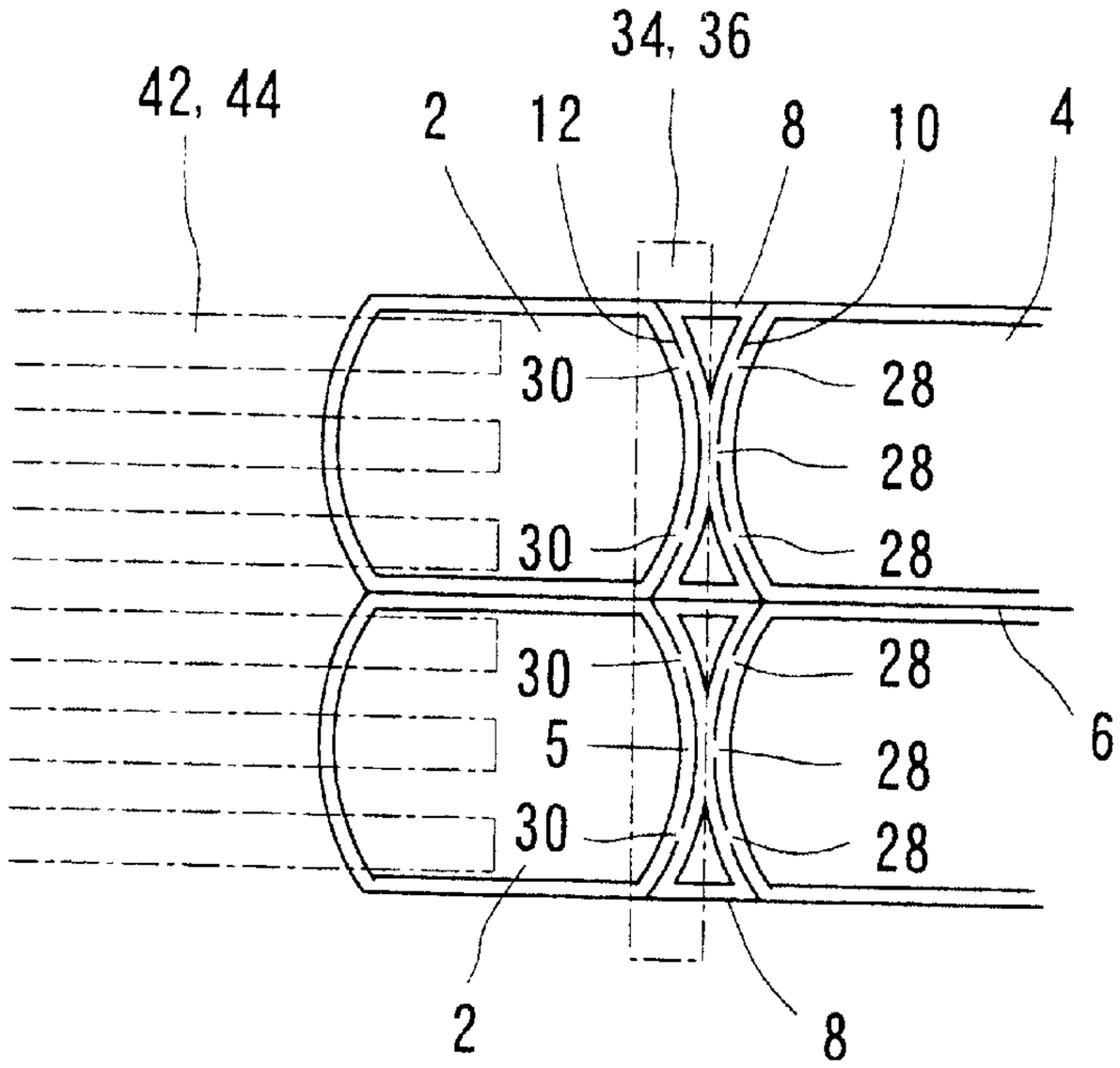
18
32

FIG. 3


34, 36
42, 44
2
12
8
10
4
30
28
28
30
28
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5
28
30
28
6
2
8

FIG. 4

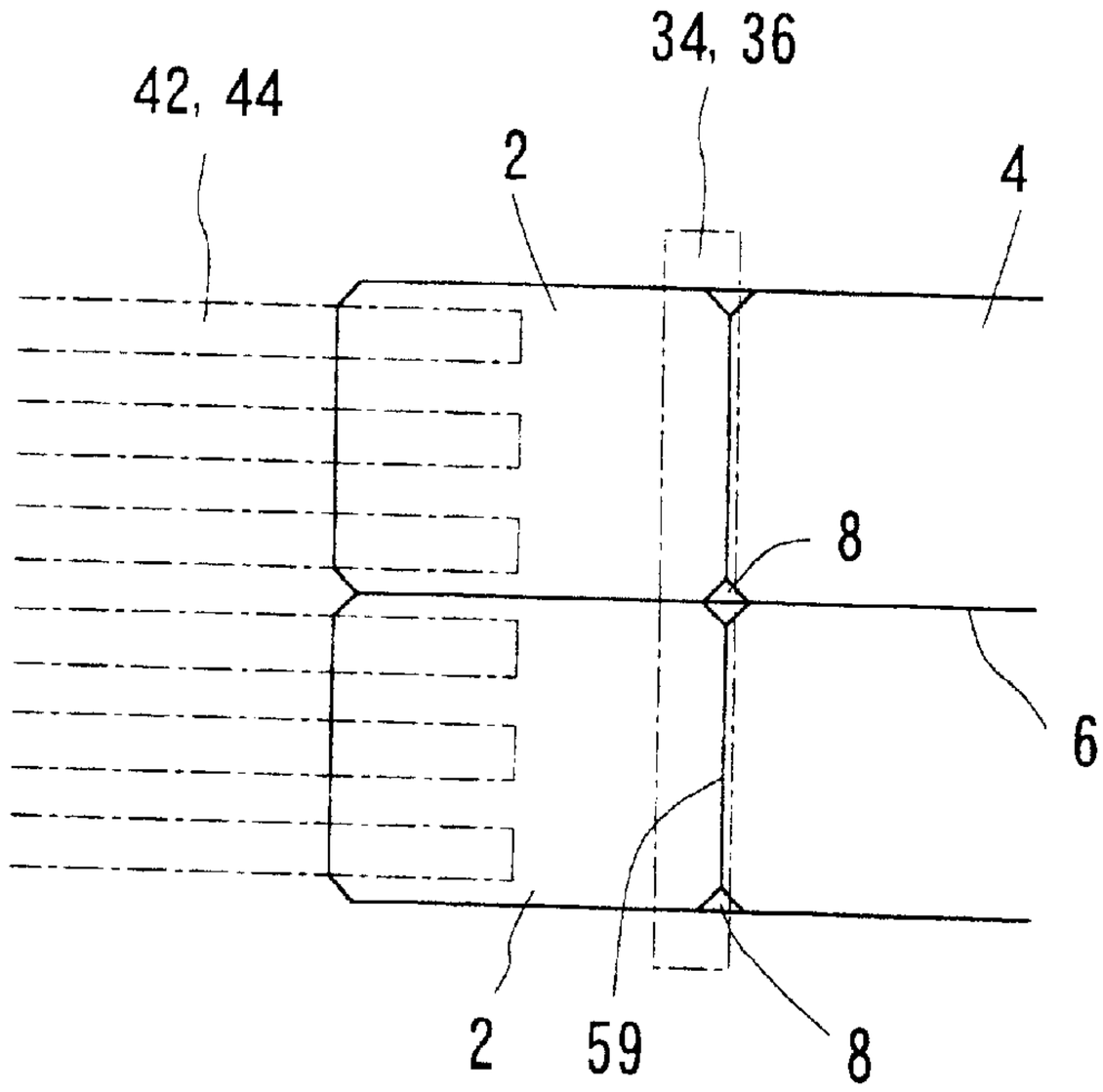

34, 36
42, 44
2
4
8
6
2
59
8

FIG. 5

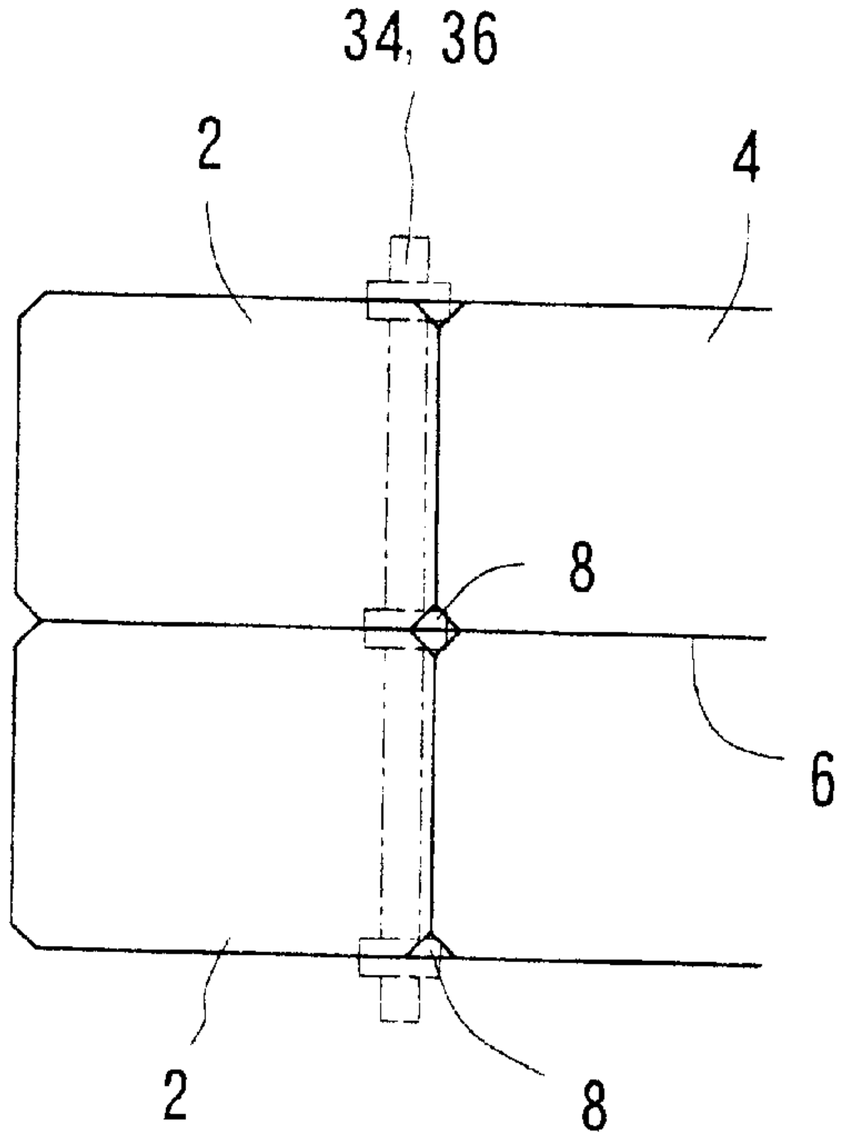


FIG. 6

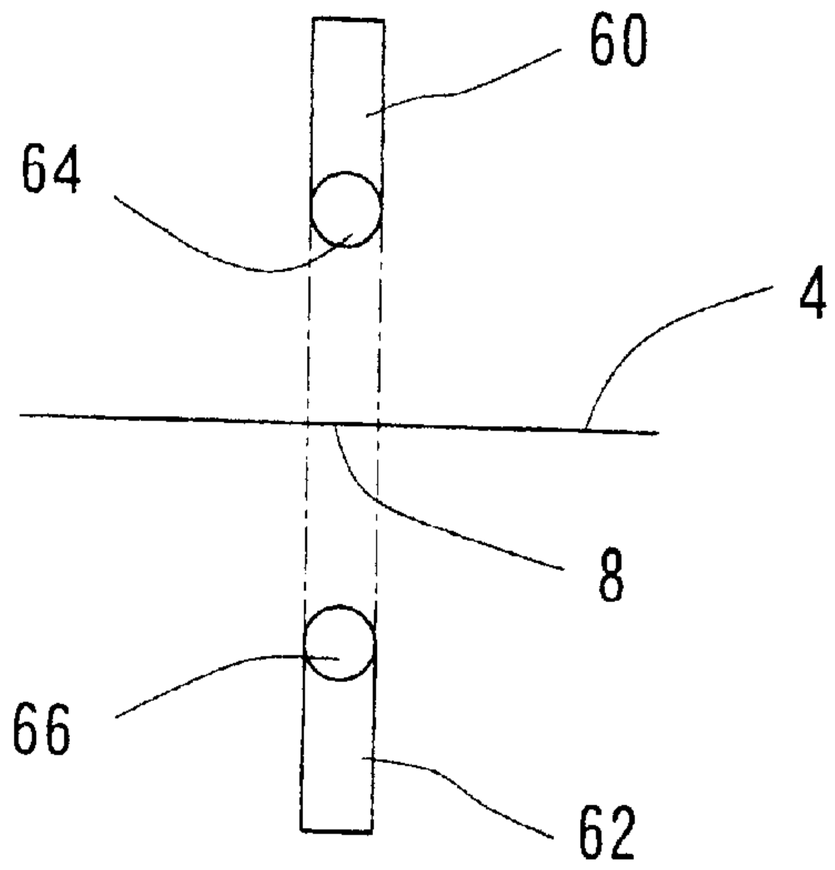


FIG. 7

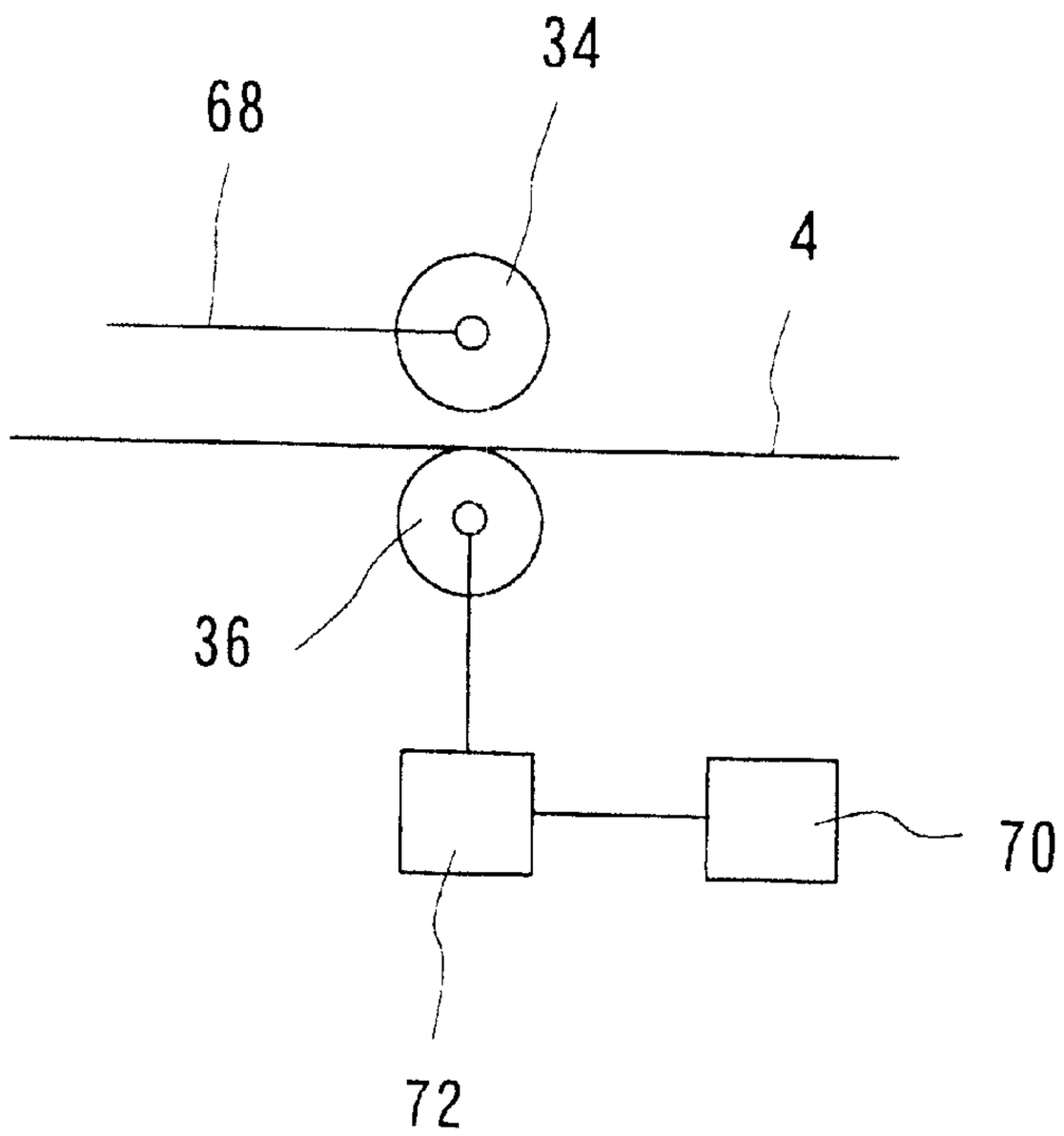


FIG. 8

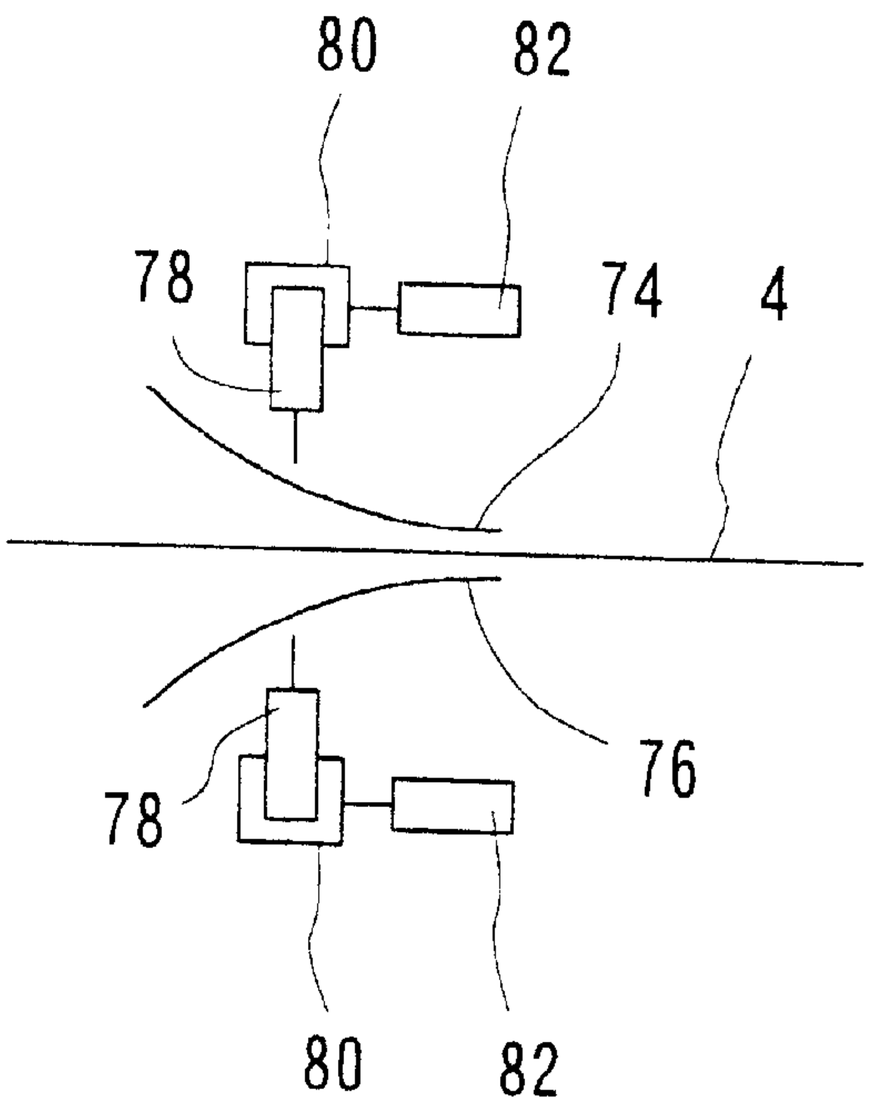
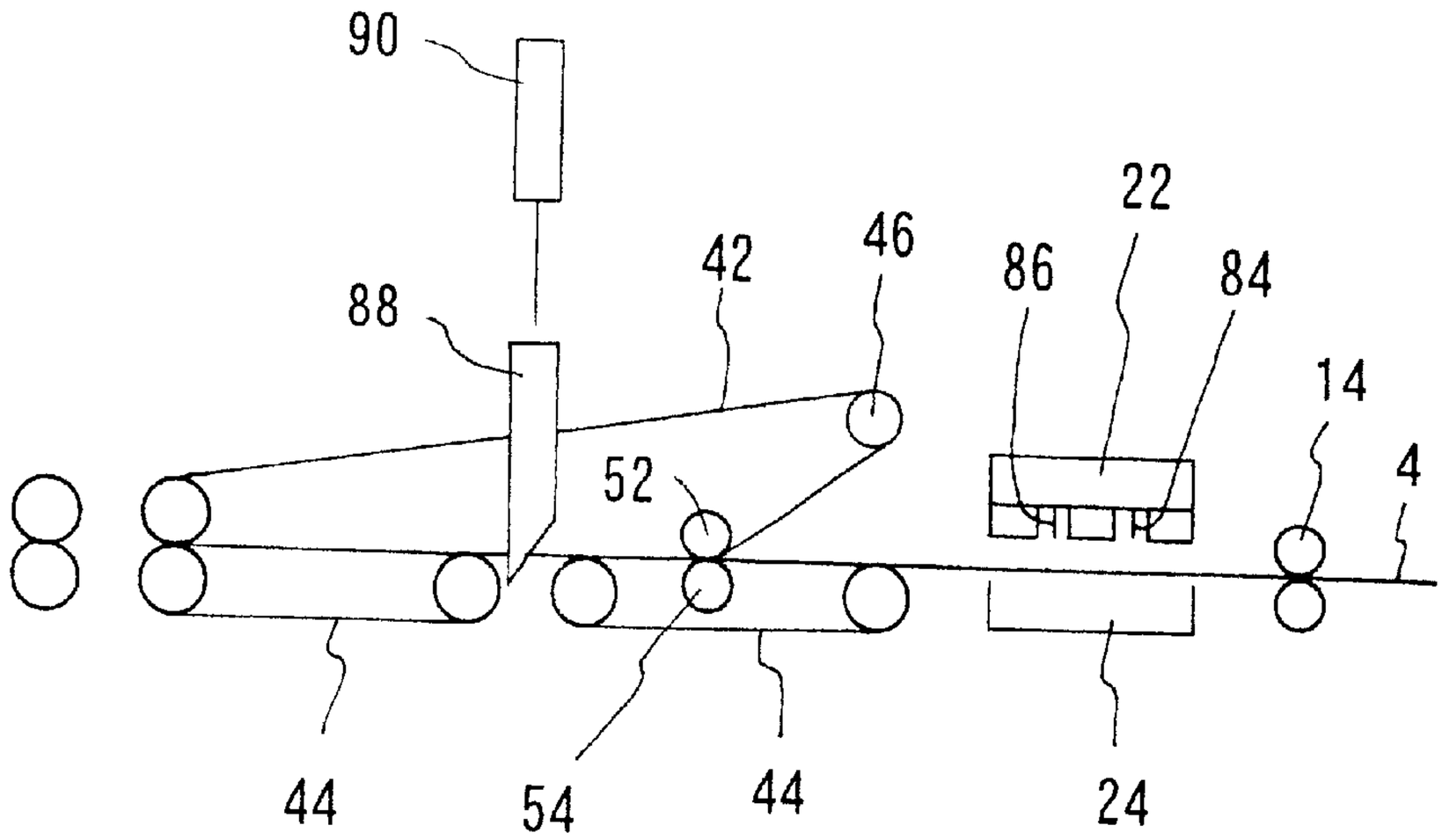


FIG. 9


90
88
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46
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22
84
14
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52
44
54
44
24

FIG. 10

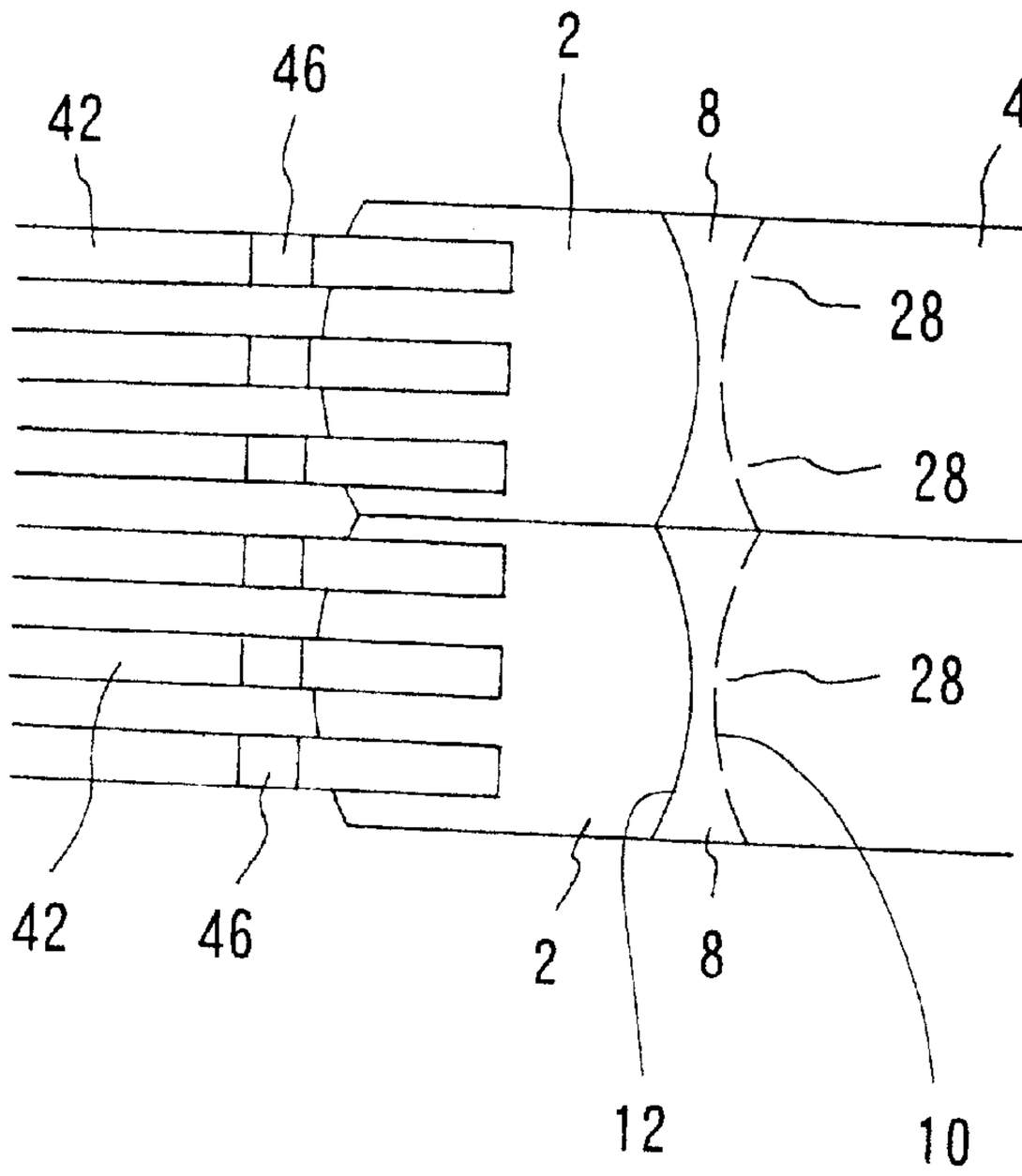
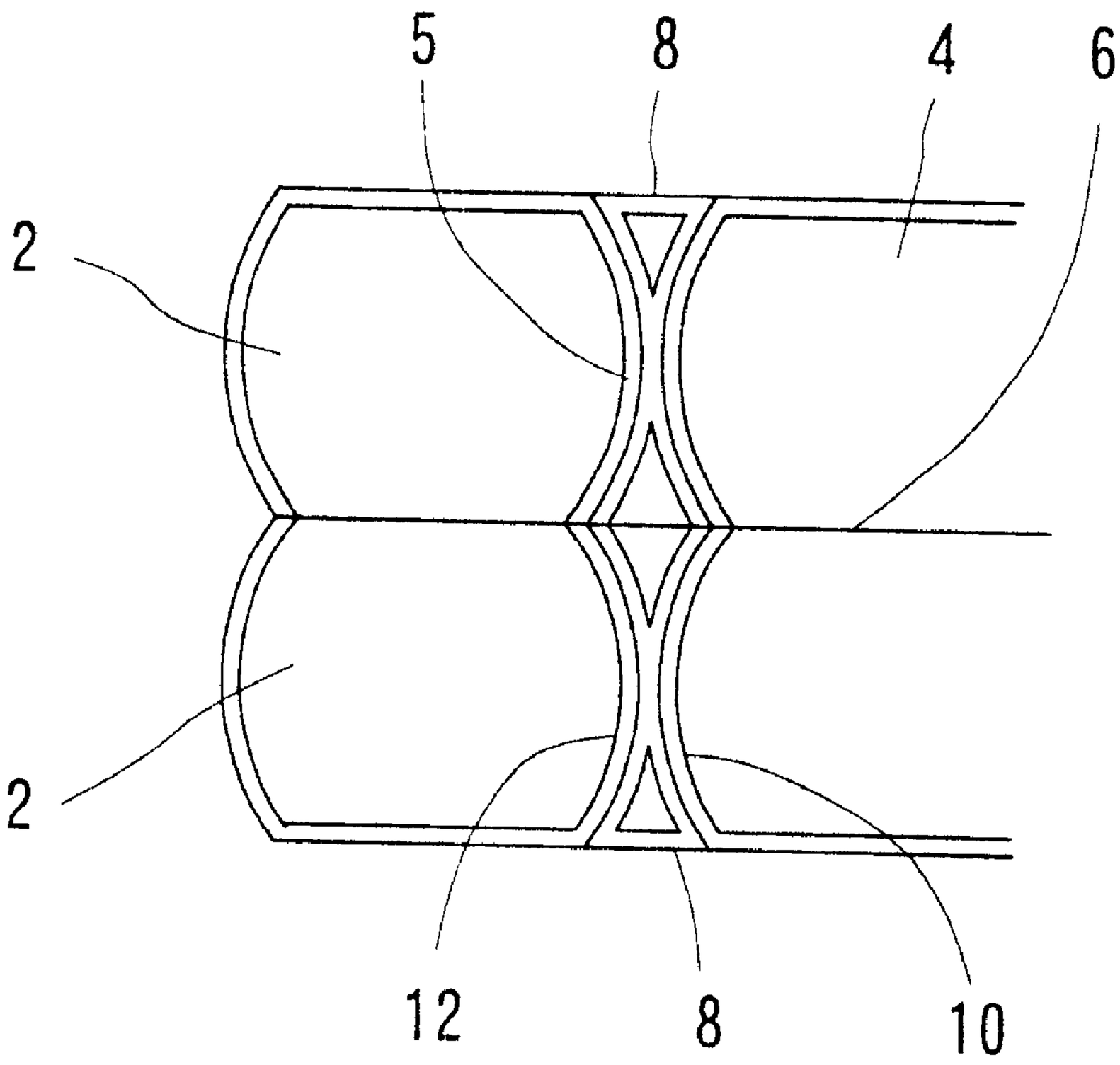

42
46
2
8
4
28
28
28
42
46
2
8
12
10

FIG. 11

Prior Art



PLASTIC BIG MAKING APPARATUS

FIELD OF THE INVENTION

The invention relates to an apparatus for making plastic bags.

PRIOR ART

There has been commercially available an apparatus for making plastic bags **2** from a web material **4** comprising two or more layers of plastic film, as shown in FIG. **11**. The apparatus includes feeding means by which the material **4** is intermittently fed for a length along a longitudinal feeding path. The material **4** is heat sealed by heat seal means longitudinally and widthwise of the material **4** whenever intermittently fed and temporarily stopped so that heat sealed portions **5** can be formed longitudinally and widthwise of the material **4**. In two rows production, the material **4** may be slitted by slitting means along a slit line **6**. In case of shaped bags **2** each of which has opposite sides curved convexly or concavely, the apparatus is arranged to successively make plastic bags **2** with wastes **8**. Each of the wastes **8** has upstream and downstream edges **10** and **12**. In general, the material **4** is totally cut by suitable cutting means along the upstream and downstream edges **10** and **12** of waste **8** whenever intermittently fed and temporarily stopped. The wastes **8** are therefore brought into existence one by one or two by two by making shaped bags **2**. The waste **8** may be called a waste material or scrap.

Under the circumstances, a hole is usually formed under the feeding path of material so that the wastes can be dropped down through the hole to be removed. However, the wastes **8** can neither always be dropped down nor removed even if the material **4** is totally cut. The plastic bags **2** and the wastes **8** may adhere to each other by reason of certain factor such as static electricity, to be fed as they are. The wastes **8** must therefore be removed later and manually by operator from the plastic bags **2**, taking labours and times. In addition, as to the hole through which the wastes **8** are dropped down, it is required to change the size of hole when changing the size of plastic bag **2** and waste **8**.

It is therefore an object of the invention to provide a new and improved apparatus for making plastic bags from a web material comprising two or more layers of plastic film, to overcome the above problems. The apparatus including feeding means by which the material is intermittently fed for a length along a longitudinal feeding path, to successively make plastic bags with wastes, each of the wastes having upstream and downstream edges.

Another object of the invention is to provide the apparatus in which the wastes can be removed automatically and reliably, without adhering to the plastic bags.

SUMMARY OF THE INVENTION

According to the invention, the apparatus comprises partially cutting means disposed at a first station predetermined along the feeding path. The material is partially cut by the partially cutting means along the upstream and downstream edges of waste whenever intermittently fed and temporarily stopped.

The apparatus further comprises waste removing means disposed at a second station predetermined downstream of and at a distance from the first station. The waste reaches the second station when the material is intermittently fed again after partially cut by the partially cutting means.

In addition, the apparatus comprises discharge means disposed at a third station predetermined downstream of and at a distance from the second station. The material reaches the third station when intermittently fed again after partially cut by the partially cutting means. The material is pulled and torn by the discharge means from the downstream edge of waste to be discharged by the discharge means as a plastic bag, the waste being pulled, torn and removed by the waste removing means from the upstream edge of waste, after the waste reaches the second station and the material reaches the third station.

In a preferred embodiment, the partially cutting means comprises Thomson blade means opposed to the material. The partially cutting means further comprises drive means by which the Thomson blade means is moved toward the material so that the material can be partially cut by the Thomson blade means along the upstream and downstream edges of waste.

The Thomson blade means has micro depressions formed and spaced from each other along the cutting edge thereof to leave micro joints formed and spaced from each other along the upstream and downstream edges of waste. The micro joints make the material partially cut. The material and the waste are kept connected with each other by the micro joints.

The material is partially cut by the partially cutting means to be pulled and torn more easily at the downstream edge than at the upstream edge of waste. The material is first pulled and torn by the discharge means from the downstream edge of waste after the waste reaches the second station and the material reaches the third station. The waste is then pulled and torn by the waste removing means from the upstream edge of waste.

The waste removing means comprises upper and lower rotating members disposed on upper and lower sides of the feeding path. The waste removing means further comprises drive means by which at least one of the upper and lower rotating members is moved toward the waste so that the waste can be sandwiched between the upper and lower rotating members. In addition, the waste removing means comprises drive means by which at least one of the upper and lower rotating members is rotated at a considerable speed so that the waste can be pulled and torn by the upper and lower rotating members.

The discharge means comprises upper and lower belts between which the material is directed and sandwiched to be pulled and torn by the upper and lower belts.

In other embodiment, the waste is held by the waste removing means after reaching the second station so that the material can be pulled and torn by the discharge means from the downstream edge of waste. The waste is then pulled and torn by the waste removing means from the upstream edge of waste.

The waste removing means may comprise drive means by which at least one of the upper and lower rotating members is moved toward the waste so that the waste can be sandwiched between and held by the upper and lower rotating members after reaching the second station.

In other embodiment, the waste removing means comprises upper and lower fingers disposed on upper and lower sides of the feeding path. The waste removing means further comprises drive means by which at least one of the upper and lower fingers is moved toward the waste so that the waste can be sandwiched between and held by the upper and lower fingers after reaching the second station. In addition, the waste removing means comprises drive means by which the upper and lower fingers are moved in a direction so that the waste can be pulled and torn by the upper and lower fingers.

In other embodiment, the discharge means comprises drive means by which the upper and lower belts are driven at a first speed. The waste removing means comprises drive means by which at least one of the upper and lower rotating members is moved toward the waste so that the waste can be sandwiched between the upper and lower rotating members at the same time as the material is sandwiched between the upper and lower belts. The waste removing means further comprises drive means by which at least one of the upper and lower rotating members is rotated at a second speed lower than the first speed so that the material is pulled and torn by the upper and lower belts, while the waste is pulled and torn by the upper and lower rotating members, by means of a difference in speed between the upper and lower belts and the upper and lower rotating members.

In other embodiment, the apparatus comprises partially cutting means combined with totally cutting means. The material is partially cut by the partially cutting means along the upstream edge and totally cut by the totally cutting means along the downstream edge of waste whenever intermittently fed and temporarily stopped.

The apparatus further comprises discharge means disposed downstream of and at a distance from the partially and totally cutting means. The material is discharged by the discharge means as a plastic bag after partially and totally cut. The waste then reaches the discharge means when the material is intermittently fed again, to be pulled, torn and removed by the discharge means from the upstream edge of waste.

The partially cutting means comprises drive means by which the Thomson blade means is moved toward the material so that the material can be partially cut by the Thomson blade means along the upstream edge of waste. The micro joints make the material partially cut. The waste is kept connected with the material by the micro joints.

The discharge means comprises upper and lower belts, the material being directed and sandwiched between the upper and lower belts to be discharged by the upper and lower belts. The waste is then directed and sandwiched between the upper and lower belts to be pulled, torn and removed by the upper and lower belts. Stop means is incorporated into the upper and lower belts so that the waste can strike against the stop means for dropping from the upper and lower belts.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side view of a preferred embodiment of the invention.

FIG. **2** is an enlarged view of the Thomson blades of FIG. **1**.

FIG. **3** is a plan view of the apparatus of FIG. **1**.

FIG. **4** is a plan view of other embodiment.

FIG. **5** is a plan view of other embodiment.

FIG. **6** is a side view of other embodiment.

FIG. **7** is a side view of other embodiment.

FIG. **8** is a side view of other embodiment.

FIG. **9** is a side view of other embodiment.

FIG. **10** is a plan view of the apparatus of FIG. **9**.

FIG. **11** is a plan view showing plastic bags and wastes in prior art.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, FIG. **1** illustrates an apparatus for making plastic bags **2** from a web material **4** comprising two or more layers of plastic film, according to the invention. Each of the plastic bags **2** comprises a shaped bag having opposite sides curved convexly or concavely, as in the case of the apparatus of FIG. **11**. The apparatus includes feeding means by which the material **4** is intermittently fed for a length along a longitudinal feeding path, to successively make plastic bags **2** with wastes **8**. Each of the wastes **8** has upstream and downstream edges **10** and **12**.

In the embodiment, the feeding means comprises upper and lower rollers **14** between which the material **4** is directed and sandwiched. The upper and lower rollers **14** are rotated by drive means such as a servo motor so that the material **4** can be intermittently fed for a length. In addition, the material **4** is heat sealed by heat seal means **16** longitudinally and widthwise of the material **4** whenever intermittently fed and temporarily stopped so that heat sealed portions **5** can be formed longitudinally and widthwise of the material **4**. The material **4** is slitted by slitting means along a slit line **6**, as in the case of the apparatus of FIG. **11**.

The apparatus further includes partially cutting means disposed at a first station predetermined along the feeding path of material **4**. The material **4** is partially cut by the partially cutting means along the upstream and downstream edges **10** and **12** of waste **8** whenever intermittently fed and temporarily stopped.

The partially cutting means includes Thomson blade means comprising a pair of Thomson blades **18** and **20** and opposed to the material **4**. The Thomson blades **18** and **20** are spaced from each other along the feeding path of material **4** and mounted on a carriage **22**, the material **4** being directed between the Thomson blades **18** and **20** and a receiver **24**. The partially cutting means further includes drive means by which the Thomson blades **18** and **20** are moved toward the material **4** whenever the material **4** is intermittently fed and temporarily stopped. For example, the drive means comprises a linkage **26** by which the carriage **22** is connected to the heat seal means **16**. The Thomson blades **18** and **20** and the carriage **22** are therefore moved and lowered by the linkage **26** synchronously with the heat seal means **16** whenever the material **4** is intermittently fed and temporarily stopped so that the material **4** can be sandwiched between the Thomson blades **18** and **20** and the receiver **24** to be partially cut by the Thomson blades **18** and **20** along the upstream and downstream edges **10** and **12** of waste **8**.

In this connection, it should be noted that the material **4** is not totally cut but partially cut by the Thomson blades **18** and **20**. The material **4** and the waste **8** are therefore not completely separated from each other. In the embodiment, each of the Thomson blades **18** and **20** has micro depressions formed and spaced from each other along the cutting edge thereof to leave micro joints **28** and **30** formed and spaced from each other along the upstream and downstream edges **10** and **12** of waste **8**, as shown in FIG. **3**. The micro joints **28** and **30** make the material **4** partially cut. The material **4** and the waste **8** are kept connected with each other by the micro joints **28** and **30**. In addition, the micro joints **30** are less in number than the micro joints **28**. It should therefore be understood that the material **4** is partially cut by the Thomson blades **18** and **20** to be pulled and torn more easily at the downstream edge **12** than at the upstream edge **10** of waste **8**. The micro joints **28** and **30** are shown in exaggeration for convenience. In point of fact, each of the micro joints **28** and **30** has a very small size of about 0.1 mm.

Furthermore, urethan rubbers **32** are disposed on the opposite sides of each of the Thomson blades **18** and **20** and

mounted on the carriage **22**, as shown in FIG. **2**. The urethan rubbers **32** are pressed against the material **4** and the receiver **24** to be elastically deformed so that the material **4** can be held by the urethan rubbers **32** when partially cut by the Thomson blades **18** and **20**. The carriage **22** and the Thomson blades **18** and **20** are then moved and lifted by the linkage **26** synchronously with the seal means **16** to be retracted from the material **4** and the receiver **24**. The urethan rubbers **32** are elastically restored to the original state so that the material **4** can be pushed by the urethan rubbers **32** to be separated from the Thomson blades **18** and **20**. This prevents the material **4** from adhering to the Thomson blades **18** and **20**. The material **4** is therefore not pulled upwardly by the Thomson blades **18** and **20**.

The apparatus further includes waste removing means disposed at a second station predetermined downstream of and at a distance from the first station at which the Thomson blades **18** and **20** are disposed. The waste **8** reaches the second station when the material **4** is intermittently fed again after partially cut by the Thomson blades **18** and **20**, as described later.

In the embodiment, the waste removing means includes upper and lower rotating means comprising upper and lower rollers **34** and **36** and disposed on upper and lower sides of the feeding path of material **4**. The waste removing means further includes drive means by which at least one of the upper and lower rollers **34** and **36** is moved toward the waste **8**. The drive means comprises a linkage **38** by which the upper roller **34** is connected to the heat seal means **16**, as in the case of the Thomson blades **18** and **20** and the linkage **26**. The upper roller **34** is therefore moved and lowered by the linkage **38** synchronously with the heat seal means **16** whenever the material **4** is intermittently fed and temporarily stopped. In addition, the waste removing means includes drive means by which at least one of the upper and lower rollers **34** and **36** is rotated at a considerable speed. The drive means comprises a drive motor **40** connected to the lower roller **36**. The lower roller **36** is rotated by the drive motor **40** counterclockwise in FIG. **1** and at all times.

In addition, the apparatus includes discharge means disposed at a third station predetermined downstream of and at a distance from the second station at which the upper and lower rollers **34** and **36** are disposed. The material **4** reaches the third station when intermittently fed again after partially cut by the Thomson blades **18** and **20**, as also described later. The material **4** is pulled and torn by the discharge means from the downstream edge **12** of waste **8** to be discharged by the discharge means as a plastic bag **2**, the waste **8** being pulled, torn and removed by the upper and lower rollers **34** and **36** from the upstream edge **10** of waste **8**, after the waste **8** reaches the second station and the material **4** reaches the third station, as also described later.

In the embodiment, the discharge means includes upper and lower belts **42** and **44** between which the material **4** is directed and sandwiched. The upper belt **42** is engaged with a pulley **46**. The discharge means further includes a linkage **48** by which the pulley **46** is connected to the heat seal means **16**. The pulley **46** is therefore moved and lowered by the linkage **48** synchronously with the heat seal means **16** whenever the material **4** is intermittently fed and temporarily stopped. In addition, the discharge means further includes drive means by which the upper and lower belts **42** and **44** are driven at a considerable speed. The drive means comprises a drive motor **50** connected to pulleys **52** and **54**, the upper and lower belts **42** and **44** being engaged with the pulleys **52** and **54**.

Furthermore, a stop **56** is disposed between the second and third station and on the lower side of the feeding path of material **4**. The stop **56** is connected by a linkage **58** to the heat seal means **16** to be moved synchronously with the heat seal means **16** whenever the material **4** is intermittently fed.

In the apparatus, as to the distance between the first station at which the Thomson blades **18** and **20** are disposed and the second station at which the upper and lower rollers **34** and **36** are disposed, the distance corresponds to the length for which the material **4** is intermittently fed. As to the distance between the second station and the third station at which the upper and lower belts **42** and **44** are disposed, it also corresponds to the length for which the material **4** is intermittently fed. Accordingly, the waste **8** reaches the second position to be directed between the upper and lower rollers **34** and **36** when the material **4** is intermittently fed again after partially cut by the Thomson blades **18** and **20**. The material **4** reaches the third station to be directed between the upper and lower belts **42** and **44** when intermittently fed again after partially cut by the Thomson blades **18** and **20**.

Furthermore, in the apparatus, the material **4** is temporarily stopped when the waste **8** reaches the second station and the material **4** reaches the third station. The pulley **46** is then moved and lowered by the linkage **48** synchronously with the heat seal means **16** so that the material **4** can be first sandwiched between the upper and lower belts **42** and **44**. The material **4** is therefore pulled by the upper and lower belts **42** and **44** driven by the drive motor **50**. In addition, the material **4** was partially cut by the Thomson blades **18** and **20** to be pulled and torn more easily at the downstream edge **12** than at the upstream edge **10** of waste **8** before reaching the second and third stations, as described above. Accordingly, the material **4** is first pulled and torn by the upper and lower belts **42** and **44** from the downstream edge **12** of waste **8** after the waste **8** reaches the second station and the material **4** reaches the third station. The material **4** is therefore discharged by the upper and lower belts **42** and **44** as a plastic bag **2**.

The upper roller **34** is then moved and lowered by the linkage **38** so that the waste **8** can be sandwiched between the upper and lower rollers **34** and **36**. The lower roller **36** is rotated by the motor **40** counterclockwise in FIG. **1**, as described above, so that the upper roller **34** can be rotated by the lower roller **36** clockwise in FIG. **1** when the waste **8** is sandwiched between them. Accordingly, the waste **8** is then pulled and torn by the upper and lower rollers **34** and **36** from the upstream edge **10** of waste **8**. In addition, the stop **56** is moved by the linkage **58** into the feeding path of material **4** at the same time as the upper roller **34** is moved by the linkage **38**. The waste **8** is therefore torn and removed by the upper and lower rollers **34** and **36** to strike against the stop **56** for dropping along the stop **56**.

The material **4** is partially cut and intermittently fed again and again, to successively make plastic bags **2** with wastes **8**. The material **4** is pulled and torn again and again to be discharged as a plastic bag **2**. The waste **8** is pulled, torn and removed again and again. To be exact, in the two rows production in which the material **4** is slitted by slitting means along the slit line **6**, the material **4** is pulled and torn again and again to be discharged as plastic bags **2**. The wastes **8** are pulled, torn and removed again and again.

Accordingly, in the apparatus, the wastes **8** can be removed automatically and reliably. Unlike the prior art, the plastic bags **2** and the wastes **8** can not adhere to each other by reason of certain factor such as static electricity, to be fed as they are.

As to the upper and lower rollers **34** and **36**, the upper roller **34** may be positioned slightly downstream of the

lower roller **36** so that the waste **8** can be sandwiched between the upper and lower rollers **34** and **36** and then torn and removed downstream of and obliquely downward from the upper and lower rollers **34** and **36**. In the case, the waste **8** can strike against the stop **56** which is not moved into the feeding path of material **4**. The stop **56** is therefore not always required to be moved.

By the way, it should be noted that the material **4** is intermittently fed for a length which corresponds to the sum of sizes of plastic bag **2** and waste **8**. As to the distance between the first station at which the Thomson blades **18** and **20** are disposed and the second station at which the upper and lower rollers **34** and **36** are disposed, it must correspond to the length for which the material **4** is intermittently fed, as described above. In this connection, the apparatus may include drive means comprising ball screws by which the upper and lower rollers **34** and **36** are moved along the feeding path of material **4** to adjust the distance between the first and second stations when changing the the size of plastic bag **2** and waste **8**. The apparatus is therefore suitable to change the size of plastic bag **2** and waste **8** without difficulty. The upper and lower rollers **34** and **36** may be moved by drive means other than the ball screws.

As to the upper and lower rollers **34** and **36**, instead of the lower roller **36** rotated at all the times, the upper roller **34** may be rotated at all times. Instead of the upper roller **34** moved by the linkage **38**, the lower roller **34** may be moved by a linkage so that the waste **8** can be sandwiched between the upper and lower rollers **34** and **36**. The upper and lower rollers **34** and **36** may be rotated at all times respectively. The upper and lower rollers **34** and **36** may be moved by linkages respectively.

One of the upper and lower rollers **34** and **36** may be rotated not at all times but temporarily. The other roller is moved by the linkage while one of the upper and lower rollers is rotated so that the waste **8** can be sandwiched between and pulled and torn by the upper and lower rollers **34** and **36**.

It is not always necessary to leave the micro joints **28** and **30** formed and spaced from each other along the upstream and downstream edges **10** and **12** of waste **8**. The material **4** may be half cut by the Thomson blades to a depth to be partially cut, along the upstream and downstream edges **10** and **12** of waste **8** so that the material **4** can be pulled and torn by the upper and lower belts **42** and **44** from the downstream edge **12** of waste **8**, the waste **8** being pulled and torn by the upper and lower rollers **34** and **36** from the upstream edge **10** of waste **8**. The material **4** may also be half cut by the Thomson blades to a depth to be partially cut so that it can be pulled and torn more easily at the downstream edge **12** than at the upstream edge **10** of waste **8**. The material **4** may be partially cut by partially cutting means other than the Thomson blades.

As to the plastic bag **2** to be corner cut, the apparatus is arranged to successively make plastic bags **2** with wastes **8**, as shown in FIG. **4**. In the case, the material **4** may be partially or totally cut by the Thomson blades along cutting lines **59**. In addition, the material **4** may be partially cut by the Thomson blades along the upstream and downstream edges of the waste **8** and pulled and torn by the upper and lower belts **42** and **44** from the downstream edge of waste **8** to be discharged by the upper and lower belts **42** and **44** as a plastic bag **2**. The waste **8** should be then pulled, torn and removed by the upper and lower rollers **34** and **36** from the upstream edge of waste **8**.

In stead of each of the upper and lower rollers **34**, **36** having a diameter, it may have locally large portions so that the waste **8** can be sandwiched between and pulled, torn and removed by the locally large portions, as shown in FIG. **5**.

The waste removing means may include rotating members other than the upper and lower rollers **34** and **36**. For example, the waste removing means may include rotating members comprising upper and lower arms **60** and **62**, as shown in FIG. **6**. The upper arm **60** is rotated by drive means clockwise about a pin **64** while the lower arm **62** is rotated by drive means counterclockwise about a pin **66** so that the waste **8** can be sandwiched between and pulled, torn and removed downstream of the upper and lower arms **60** and **62**.

In other embodiment shown in FIG. **7**, the waste **8** is held by the waste removing means after reaching the second station so that the material **4** can be pulled and torn by the discharge means from the downstream edge **12** of waste **8**. The waste **8** is then pulled and torn by the waste removing means from the upstream edge **10** of waste **8**. The waste removing means includes upper and lower rotating member comprising upper and lower rollers **34** and **36** and disposed on the upper and lower sides of the feeding path of material **4**. The discharge means comprises upper and lower belts **42** and **44**, as in the case of the apparatus of FIG. **1**.

In the embodiment of FIG. **7**, the waste removing means further includes drive means by which at least one of the upper and lower rollers **34** and **36** is moved toward the waste **8** so that the waste **8** can be sandwiched between the upper and lower rollers **34** and **36** after reaching the second station. The drive means comprises a lever **68** and a linkage by which the upper roller **34** is connected to the heat seal means. The upper roller **34** is therefore moved by the lever **68** and the linkage so that the waste **8** can be sandwiched between the upper and lower rollers **34** and **36**.

The upper and lower rollers **34** and **36** are first kept from being rotated so that the waste **8** can be held by the upper and lower rollers **34** and **36**. The material **4** can therefore be pulled and torn by the upper and lower belts **42** and **44** from the downstream edge **12** of waste **8** to be discharged. Accordingly, unlike the apparatus of FIG. **1**, the material **4** has therefore not to be partially cut by the partially cutting means to be pulled and torn more easily at the downstream edge **12** than at the upstream edge **10** of waste **8**.

In addition, the waste removing means includes drive means by which at least one of the upper and lower rollers **34** and **36** is rotated at a considerable speed so that the waste **8** can be pulled and torn by the upper and lower rollers **34** and **36**. The drive means comprises a control **70** connected to a drive motor **72** such as a servo motor which is connected to the lower roller **36**. The lower roller **36** is rotated by the control **70** and the drive motor **72** counterclockwise in FIG. **7** after the material **4** is torn and discharged. The upper roller **34** is therefore rotated by the lower roller **36** clockwise in FIG. **7** so that the waste **8** can be pulled and torn by the upper and lower rollers **34** and **36** from the upstream edge **10** of waste **8** to be removed.

The drive motor **72** can be controlled by the control **70** to change the speed of the upper and lower rollers **34** and **36**. For example, the upper and lower rollers **34** and **36** are rotated at a high speed when the waste **8** is pulled and torn. The upper and lower rollers **34** and **36** are then decelerated into a low speed before the waste **8** is released from the upper and lower rollers **34** and **36**. The waste **8** is therefore released and removed slowly.

In the embodiment of FIG. **7**, the apparatus may include ball screws by which the upper and lower rollers **34** and **36** are moved along the feeding path of material **4** to adjust the

distance between the first and second stations when changing the size of plastic bag **2** and waste **8**. The lower roller **36** may be moved by a linkage so that the waste **8** can be sandwiched between the upper and lower rollers **34** and **36**. The drive motor **72** may be connected not to the lower roller **36** but to the upper roller **34** so that the upper and lower rollers **34** and **36** can be rotated by the drive motor **72**. The upper and lower rollers **34** and **36** may be moved by linkages respectively. The drive motor **72** may be connected to the upper and lower rollers **34** and **36**.

As to the plastic bag **2** and the waste **8** of FIG. **4**, the waste **8** can be pulled, torn and removed by the upper and lower rollers **34** and **36** of FIG. **7**. The upper and lower rollers **34** and **36** may have locally large portions, as in the case of those of FIG. **5**. The waste removing means may comprise rotating members other than the upper and lower rollers **34** and **36**.

In other embodiment shown in FIG. **8**, the waste removing means includes upper and lower fingers **74** and **76** disposed on upper and lower sides of the feeding path of material **4**. The waste removing means further includes drive means by which at least one of the upper and lower fingers **74** and **76** is moved toward the waste **8**. The drive means comprises air cylinders **78** mounted on carriages **80** and connected to the upper and lower fingers **74** and **76**. The upper and lower fingers **74** and **76** are moved by the air cylinders **78** so that the waste **8** can be sandwiched between and held by the upper and lower fingers **74** and **76** after reaching the second station at which the upper and lower fingers **74** and **76** are disposed.

Accordingly, the material **4** can be pulled, torn and discharged by the upper and lower belts, as in the case of the apparatus of FIG. **7**. In addition, the waste removing means include drive means by which the upper and lower fingers **74** and **76** are moved in a direction in which the material **4** is intermittently fed. The drive means comprises air cylinders **82** connected to the carriages **80**. The upper and lower fingers **74** and **76** and the carriages **80** are moved by the air cylinders **82** so that the waste **8** can be pulled and torn by the upper and lower fingers **74** and **76**.

In the embodiment of FIG. **8**, the apparatus may include ball screws by which the upper and lower fingers **74** and **76** are moved along the feeding path of material **4** to adjust the distance between the first and second stations when changing the size of plastic bag **2** and waste **8**. A plurality of upper and lower fingers **74** and **76** may be spaced from each other widthwise of the material **4**. The upper and lower fingers **74** and **76** may be movable widthwise of the material **4** to change the spaces of upper and lower fingers **74** and **76**. In the case, as to the plastic bag **2** and the waste **8** of FIG. **4**, the waste **8** can be pulled, torn and removed by the upper and lower fingers **74** and **76**.

In other embodiment, the discharge means includes the upper and lower belts **42** and **44** shown in FIG. **1**. The upper and lower belts **42** and **44** are driven at a first speed. The waste removing means includes upper and lower rotating members comprising the upper and lower rollers **34** and **36** in FIG. **1**, FIG. **4** or FIG. **5**. At least one of the upper and lower rollers **34** and **36** is moved toward the waste **8** so that the waste **8** can be sandwiched between the upper and lower rollers **34** and **36** at the same time as the material **4** is sandwiched between the upper and lower belts **42** and **44**. In addition, at least one of the upper and lower rollers **34** and **36** is rotated at a second speed lower than the first speed. Accordingly, the material **4** is pulled and torn by the upper and lower belts **42** and **44**, while the waste **8** is pulled and torn by the upper and lower rollers **34** and **36**, by means of a difference in speed between the upper and lower belts **42** and **44** and the upper and lower rollers **34** and **36**.

In other embodiment shown in FIG. **9**, the apparatus includes partially cutting means combined with totally cutting means. The material **4** is partially cut by the partially cutting means along the upstream edge **10** and totally cut by the totally cutting means along the downstream edge **12** of waste **8** whenever intermittently fed and temporarily stopped.

The partially cutting means includes Thomson blade means comprising a Thomson blade **84**, mounted on a carriage **22** and opposed to the material **4**. The partially cutting means further includes drive means such as the linkage **26**, as in the case of the Thomson blades **18** and **20** of FIG. **1**. The Thomson blade **84** has the same micro depressions as the Thomson blade **18** or **20**. Accordingly, the Thomson blade **84** is moved toward the material **4** so that the material **4** can be partially cut by the Thomson blade **84** along the upstream edge **10** of waste **8**. The micro joints make the material **4** partially cut. The waste **8** is therefore kept connected with the material **4** by the micro joints.

The totally cutting means comprises Thomson blade **86** mounted on the carriage **22** and opposed to the material **4**. The Thomson blade **86** has no depression. Accordingly, the Thomson blade **86** is moved toward the material **4** so that the material **4** can be totally cut by the Thomson blade **86** along the downstream edge **12** of waste **8**.

The apparatus further includes discharge means disposed downstream of and at a distance from the Thomson blades **84** and **86**. The discharge means comprises upper and lower belts **42** and **44** between which the material **4** is directed. The upper belt **42** is engaged with the pulley **46** which is moved by the linkage **48**, as in the case of the apparatus of FIG. **1**, so that the material **4** can be sandwiched between the upper and lower belts **42** and **44** when partially and totally cut by the Thomson blades **84** and **86**. The material **4** is therefore discharged by the upper and lower belts **42** and **44** as a plastic bag **2** after partially and totally cut by the Thomson blades **84** and **86**. The pulley **46** is then moved by the linkage **48** to return to the original position.

The waste **8** then reaches the upper and lower belts **42** and **44** when the material **4** is intermittently fed again. In the embodiment, the waste **8** is directed and sandwiched between the upper and lower belts **42** and **44** at the position of pulleys **52** and **54**. The waste **8** is therefore pulled, torn and removed by the upper and lower belts **42** and **44** from the upstream edge **10** of waste **8**.

The apparatus further includes stop means incorporated into the upper and lower belts **42** and **44**. In the embodiment, the upper belt **42** comprises a plurality of narrow belts extending parallel to the feeding path of material **4** and spaced from each other perpendicularly to the feeding path of material **4**, as shown in FIG. **10**. The stop means comprises a stop **88** which is comb-shaped and inserted between the narrow belts **42**. The lower belt **44** comprises upstream and downstream belts spaced from each other along the feeding path of material **4**. The stop **88** is moved by an air cylinder **90** to advance into the feeding path of material **4** between the upstream and downstream belts **44** when the waste **8** is pulled and torn by the upper and lower belts **42** and **44** so that the waste **8** can strike against the stop **88** to pass between the upstream and downstream belts **44** for dropping from the upper and lower belts **42** and **44**. The stop **88** is then moved by the air cylinder **90** to return the original position.

The material **4** is partially and totally cut again and again, to be discharged as a plastic bag **2**. The waste **8** is then pulled, torn and removed again and again.

The apparatus may include detector means for detecting rejected bags. In the case, the stop **88** may be moved in response to the detecting signal from the detector means so that rejected bags can be removed by the stop **88**.

What is claimed is:

1. An apparatus for making plastic bags from a web material comprising two or more layers of plastic film, said apparatus including feeding means by which said material is intermittently fed for a length along a longitudinal feeding path, and heat seal means by which said material is heat sealed whenever intermittently fed and temporarily stopped, to successively make plastic bags with wastes, each of said wastes having upstream and downstream edges, said apparatus comprising:

partially cutting means disposed at a first station predetermined along said feeding path, said material being partially cut by said partially cutting means along said upstream and downstream edges of waste whenever intermittently fed and temporarily stopped;

waste removing means disposed at a second station predetermined downstream of and at a distance from said first station, said waste reaching said second station when said material is intermittently fed again after partially cut by said partially cutting means; and

discharge means disposed at a third station predetermined downstream of and at a distance from said second station, said material reaching said third station when intermittently fed again after partially cut by said partially cutting means, said material being pulled and torn by said discharge means from said downstream edge of waste to be discharged by said discharge means as a plastic bag, said waste being pulled, torn and removed by said waste removing means from said upstream edge of waste, after said waste reaches said second station and said material reaches said third station.

2. The apparatus as set forth in claim **1** wherein said partially cutting means comprises blade means opposed to said material, and drive means by which said blade means is moved vertically toward said material so that said material can be partially cut by said blade means along said upstream and downstream edges of waste.

3. The apparatus as set forth in claim **2** wherein said blade means has micro depressions formed and spaced from each other along the cutting edge thereof to leave micro joints formed and spaced from each other along said upstream and downstream edges of waste, said micro joints making said material partially cut, said material and said waste being kept connected with each other by said micro joints.

4. The apparatus as set forth in any one of claims **1** to **3** wherein said material is partially cut by said partially cutting means to be pulled and torn more easily at said downstream edge than at said upstream edge of waste, said material being first pulled and torn by said discharge means from said downstream edge of waste after said waste reaches said second station and the material reaches said third station, said waste being then pulled and torn by said waste removing means from said upstream edge of waste.

5. The apparatus as set forth in claim **4** wherein said waste removing means comprises upper and lower rotating members disposed on upper and lower sides of said feeding path, drive means by which at least one of said upper and lower rotating members is moved vertically toward said waste so that said waste can be sandwiched between said upper and lower rotating members, and drive means by which at least one of said upper and lower rotating members is rotated at a considerable speed so that said waste can be pulled and torn by said upper and lower rotating members.

6. The apparatus as set forth in claim **5** wherein said discharge means comprises upper and lower belts between which said material is directed and sandwiched to be pulled and torn by said upper and lower belts.

7. The apparatus as set forth in any one of claims **1** to **3** wherein said waste is held by said waste removing means after reaching said second station so that said material can be pulled and torn by said discharge means from said downstream edge of waste, said waste being then pulled and torn by said waste removing means from said upstream edge of waste.

8. The apparatus as set forth in claim **7** wherein said waste removing means comprises upper and lower rotating members disposed on upper and lower sides of said feeding path, drive means by which at least one of said upper and lower rotating members is moved vertically toward said waste so that said waste can be sandwiched between and held by said upper and lower rotating members after reaching said second station, and drive means by which at least one of said upper and lower rotating members is rotated at a considerable speed so that said waste can be pulled and torn by said upper and lower rotating members.

9. The apparatus as set forth in claim **8** wherein said discharge means comprises upper and lower belts between which said material is directed and sandwiched to be pulled and torn by said upper and lower belts.

10. The apparatus as set forth in claim **7** wherein said waste removing means comprises upper and lower fingers disposed on upper and lower sides of said feeding path, drive means by which at least one of said upper and lower fingers is moved vertically toward said waste so that said waste can he sandwiched between and held by said upper and lower fingers after reaching said second station, and drive means by which said upper and lower fingers are moved in a direction so that said waste can be pulled and torn by said upper and lower fingers.

11. The apparatus as set forth in claim **10** wherein said discharge means comprises upper and lower belts between which said material is directed and sandwiched to be pulled and torn by said upper and lower belts.

12. The apparatus as set forth in any one of claims **1** to **3** wherein said discharge means comprises upper and lower belts between which said material is directed and sandwiched, and drive means by which said upper and lower belts are driven at a first speed, said waste removing means comprising upper and lower rotating members disposed on upper and lower sides of said feeding path, drive means by which at least one of said upper and lower rotating members is moved vertically toward said waste so that said waste can be sandwiched between said upper and lower rotating members at the same time as said material is sandwiched between said upper and lower belts, and drive means by which at least one of said upper and lower rotating members is rotated at a second speed lower than said first speed so tat said material is pulled and torn by said upper and lower belts, while said waste is pulled and torn by said upper and lower rotating members, by means of a difference in speed between said upper and lower belts and said upper and lower rotating members.

13. An apparatus for making plastic bags from a web material comprising two or more layers of plastic film, said apparatus including feeding means by which said material is intermittently fed for a length along a longitudinal feeding

path, to successively make plastic bags with wastes, each of said wastes having upstream and downstream edges, said apparatus comprising:

partially cutting means combined with totally cutting means, said material being partially cut by said partially cutting means along said upstream edge and totally cut by said totally cutting means along said downstream edge of waste whenever intermittently fed and temporarily stopped; and

discharge means disposed downstream of and at a distance from said partially and totally cutting means, said material being discharged by said discharge means as a plastic bag after partially and totally cut, said waste then reaching said discharge means when said material is intermittently fed again, to be pulled, torn and removed by said discharge means from said upstream edge of waste.

14. The apparatus as set forth in claim **13** wherein said partially cutting means comprises blade means opposed to said material, and drive means by which said blade means is moved vertically toward said material so that said material can be partially cut by said blade means along said upstream edge of waste.

15. The apparatus as set forth in claim **14** wherein said blade means has micro depressions formed and spaced from each other along the cuffing edge thereof to leave micro joints formed and spaced from each other along said upstream edge of waste, said micro joints making said material partially cut, said waste being kept connected with said material by said micro joints.

16. The apparatus as set forth in any one of claims **13** to **15** wherein said discharge means comprises upper and lower belts, said material being directed and sandwiched between said upper and lower belts to be discharged by said upper and lower belts, said waste being then directed and sandwiched between said upper and lower belts to be pulled, torn and removed by said upper and lower belts, stop means being incorporated into said upper and lower belts so that said waste can strike against said stop means for dropping from said upper and lower belts.

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